

gold leaf. Generally speaking, the capacity in electrostatic units is found to be of the same order as the length of the wire. In this or a slightly altered form, the instrument is suitable for experiments on spontaneous ionisation and the radio-activity of ordinary materials.

In experiments on emanations, induced activity, and very penetrating rays it is often convenient to increase the magnitude of the effects by allowing them to ionise a large volume of air. For this purpose the arrangement last described is particularly convenient. It is only necessary to solder a long straight wire upon the lower end of *b* and to fix *g* by means of a rubber stopper into the neck of an oil can. The leak then measured is due to the ionisation produced throughout the volume of the can. The sensitiveness, though greater than before, is not increased in the ratio of the volumes, as would otherwise be the case, owing to the increased capacity produced by the additional wire. This arrangement is especially useful for examining the induced activity which may conveniently be deposited on the wire.

A still more sensitive type of electroscope was recently invented by Mr. C. T. R. Wilson. It does not, however, appear to be an instrument which can be safely recommended to the inexperienced, so that it scarcely comes within the scope of this article. It is described in the Cambridge Phil. Soc. *Proc.*, vol. xii. p. 135, and may be bought from the Cambridge Scientific Instrument Company. Much further information about electroscopes and electrometers for radio-active work will also be found in Prof. Rutherford's book on radio-activity, chapter iii.

O. W. RICHARDSON.

GEOLOGICAL SURVEY OF CANADA.

THE Geological Survey of Canada, which was established in 1842 under the direction of Mr. (afterwards Sir) William E. Logan, commenced its labours with 1500*l.*, which was voted by the Provincial Legislature. The sum seems to have been granted without any clear idea of the length of time which the survey would take, but apparently it was expected to last about two years.

In the winter of 1844-5 the amount was expended, and Logan was more than 800*l.* out of pocket. Eventually provision was made for the continuance of the survey for five years with an annual grant of 2000*l.* Notwithstanding many difficulties and disappointments vigorous progress was made in the field work and office work, and this has been continued for upwards of sixty years under the successive directors, Selwyn, George Dawson, until now, when the survey, under Dr. Robert Bell, is provided for better than at any previous time. Thus the total votes for the present financial year amount to 22,800*l.* for general purposes, and to about 8000*l.* for the salaries of permanent officers.

We gather from the last summary report by Dr. Bell that while the Canadian Geological Survey, like that of the United States, has been engaged in palæontological, zoological, botanical, ethnological, and archæological investigations, by far the largest proportion of the work has been of an economic and practical character. Thus the justification for the increased support given to the survey is amply supplied by the investigations which have been carried on with the view of aiding the development of the mineral resources of the country. Up to the end of 1903 the publications of the survey included about 350 maps, of which 100 relate especially to mining districts; and about 250 reports and bulletins, amongst which nearly 100 are exclusively economic. During the four

years of Dr. Bell's directorship, the field parties have been increased, and during the past year they have worked in many interesting districts, from the Yukon and British Columbia in the west to New Brunswick and Nova Scotia in the east, and from southern Ontario and Quebec to Lancaster Sound in the Arctic regions. Their researches have had reference to gold, silver, lead, copper, graphite, corundum and mineral pigments; to coal, peat, petroleum and natural gas; to various building and ornamental stones, clays and cement ingredients. Hitherto unknown sections of the country have been explored and surveyed, and observations have been made on the timber, soils, and water supply, as well as on the general natural history.

The palæontological work of the survey has been carried on by the veteran palæontologist Dr. J. F. Whiteaves, aided in the department of vertebrates by Mr. Lawrence M. Lambe. In the "Contributions to Canadian Palæontology" (vol. iii.), recently issued by the survey, Mr. Lambe has described some remains of the carnivorous dinosaur *Dryptosaurus incrassatus* (Cope), from the Edmonton series of Alberta, in the North-West Territory. The strata belong to the Lower Laramie (Cretaceous) formation. The importance of a more intimate knowledge of the fauna of the Edmonton series is apparent when it is borne in mind that the beds of this series in Alberta constitute the principal coal-bearing horizon of the district.

Dr. Bell himself has been partly occupied, in conjunction with other leading geologists in Canada and the United States, in investigating the crystalline rocks in Upper Michigan, in Wisconsin and Minnesota, and in the Rainy River, Thunder Bay, and other districts of Ontario, with the view of settling disputed questions. The controversies on these rocks have long been occupying attention without any definite result. A few years ago Dr. Bell urged upon the International Committee of Geologists the desirability of forming a small central committee, the members of which should go to the ground together and look at the facts. This was carried out, and as a result the members have come to an almost complete agreement on all the vexed points. The standing committee consists of Dr. Bell and Dr. F. D. Adams (professor of geology in McGill University) for Canada, and Dr. C. W. Hayes (chief geologist of the U.S. Geological Survey) and Prof. C. R. Van Hise (president of the State University of Wisconsin) for the United States. By invitation there were also associated with them Prof. Leith (of the University of Wisconsin), Dr. Lane (State geologist of Michigan), Prof. Seaman (professor of geology in the College of Mines at Houghton, Michigan), Messrs Sebenius and Merriam (geologists of the Iron Ranges), and Prof. W. G. Miller (provincial geologist of Ontario). It is anticipated that the joint report will shortly be published.

RECENT EXPLORATION IN THE MENTONE CAVES.

PROF. MARCELLIN BOULE has recently been studying the deposits in the well known caves of the Rochers rouges (Baoussé-roussé of local patois) near Mentone, and read a paper on his results before the Société géologique de France in the early part of last year, which is published in the society's *Bulletin* (No. 1). Since the original discovery by M. Rivièrè of a human skeleton in one of these caves, the question of the age of their deposits has been debated with much warmth, but without any satisfactory result. In recent years the caves have been carefully and systematically explored under the direction of the Prince of Monaco, with the result that a great number of fossils have been obtained. Prof. Boule's researches were

conducted chiefly from the geological standpoint with the view of determining the age of the deposits, and of throwing light upon the much debated question of the oscillations of sea-level in recent times on the Mediterranean seaboard.

Prof. Boule's attention was directed in the first instance to the Grotte du Prince, which was almost intact when excavation was commenced. Here the deposits attain a thickness of more than 20 metres, and consist of basal beds of marine origin upon which strata of continental origin are superimposed. The latter can be subdivided into a number of layers, both by their physical characters and by their fossil contents, but the point of importance is that the upper and middle beds contain remains of reindeer (never previously recorded in this region), ibex, marmot, and woolly rhinoceros, that is, the fauna of the cold period of the Quaternary, while the lower beds contain quite a different fauna—*Elephas antiquus*, *Rhinoceros mercki*, and hippopotamus, that is, species belonging to the lower Quaternary fauna. The last named deposits lie upon an old raised beach which is also discernible outside the cavern, along the shore rocks, at a mean altitude of 7 metres. Almost all the contained fossils belong to the existing Mediterranean fauna, but Prof. Boule has found some beautiful examples of

7-metre beach, described at other parts of the Mediterranean littoral by MM. Depéret and Caizot, and regarded by them as of late Quaternary date, really belongs to a much more distant period, for it is anterior to the subaërial deposits containing fossils belonging to the older period of the Quaternary. If this conclusion be correct, it affords a means of fixing the age of the last oscillation of sea-level in this region. It should, however, be noted that in the discussion which followed the reading of the paper M. Depéret protested against the proposed homologising of the low raised beach (height 5-7 metres) studied by him on the French coast of the Mediterranean (e.g. in the Bay of Pierre-Formique) with the *Strombus* beach in the Mentone caves. The former type of beach contains a fauna very different from that of the *Strombus* layers, *Strombus* being absent, and all the fossils belonging to living species.

At the conclusion of his paper Prof. Boule referred to the three new human skeletons which have been recently discovered in the Grotte des Enfants. The first of these has been studied by MM. Gaudry and Verneau, and proves to be markedly Australoid in type. It was obtained in a bed containing *Ursus spelaeus*, *Hyaena spelaea*, *Felis spelaea*, &c., and rested upon a bed containing molars of *Rhinoceros mercki*. It

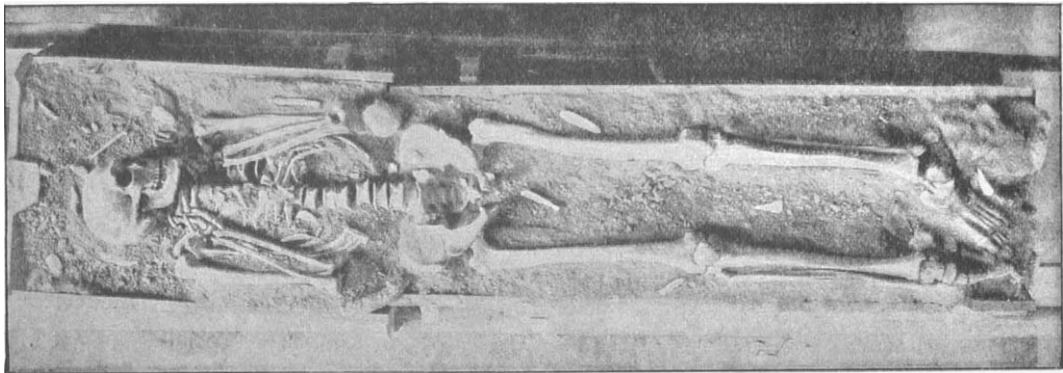


FIG. 1.—Skeleton from the Grotte des Enfants.

Strombus mediterraneus, which has been regarded as characteristic of the raised beaches of the Quaternary period in the Mediterranean area. But the Prince's cave contains other traces of marine action of a much earlier date. In its upper part, at a height of 28 metres, there is a calcareous encrustation due to the action of the waves, below which the wall of the cavern is perforated by boring molluscs. The sequence of events is therefore explained by Prof. Boule as follows:—

The sea formerly stood at the 28-metre level, and then gradually retired until it stood at a height of 7-8 metres. At this level the shell deposit was laid down on the floor of the cavern. Subsequently the movement of elevation was continued. Its extent is difficult to determine, but the oceanographical researches of the Prince of Monaco have shown that there extends along the rochers rouges at a slight depth an extensive submarine platform. This suggests that the movement—whether of the land or of the sea—continued until there was laid bare between the sea and the present irregular shore line a plain sufficiently extensive to become the home of such large animals as elephants, hippopotami, and rhinoceroses, for which the present topography allows no space. It is at least certain, according to Prof. Boule, that the

must therefore belong to the earlier part of the Quaternary period. The second skeleton was found about 0.60 metre above the first, and was accompanied by remains of the same species of mammals. The third skeleton, on the other hand, found 6 metres above the first, seems to belong to the period of the reindeer, that is, to the end of the Quaternary epoch.

THE SCIENTIFIC EXPLORATION OF LAKE TANGANYIKA.

THE committee for the scientific exploration of Lake Tanganyika (consisting of Sir John Kirk, Dr. Sclater, Sir W. Thiselton-Dyer, Prof. Lankester, Dr. Boulenger, and Mr. J. E. S. Moore) has lately received news of the progress of its envoy, Mr. W. A. Cunningham, who left England in March, 1904, under directions to continue the researches carried out by Mr. J. E. S. Moore during his two expeditions to Lake Tanganyika. Proceeding by the Zambesi and Shiré route, Mr. Cunningham was most kindly received at Zomba by Sir Alfred Sharpe, who granted him the assistance of two native collectors. Mr. Cunningham had instructions to devote his special attention to the lacustrine flora and fauna of Lake